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A SYNOPSIS OF THE GENUS STENOCRANUS, AND A NEW SPECIES OF MYSIDIA. (HOMOPTERA).

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The genus *Stenocranus* was founded by Fieber in 1866 and since that time three species have been placed in it from Europe, *minutus* Fab., *fuscovittatus* Stal. and *longipennis* Curt., *Maculipes*, described from South America by Berg in 1879 from a single female, has never been recognized since. In 1914, Crawford in his "Contribution towards a Monograph of the Delphacidæ" described *angustus* from British Honduras, *rostrifrons* from Cuba, and *similis* from Alabama.

Stenocranus crœcus of Van Duzee is now wrongly placed in the genus *Kelisia* and *saccharivorus* of Westwood does not seem to belong here. At present there are eight species described from the New World and the following paper brings the total up to twelve.

As the original descriptions are widely scattered, for the most part in publications not readily accessible to the ordinary worker, it seems advisable at this time to review the genus, describing the new species and giving comparative outline drawings of heads and the male genitalia, all drawn to the same scale.

All of the species, so far as known, with the exception of *similis*, occur on coarse grasses, rushes and sedges in swampy and boggy places. *Similis*, however, occurs abundantly on the bamboo-cane, *Arundinaria* tecta.

Nearly all of the members of this genus are of a pale straw to brown color with a more or less distinct dorsal whitish

median vitta that runs from the vertex, over the thorax and scutellum, and is continued on the elytra by the pale commisural nervures. The legs are usually lineated with fuscous.

The genus may be briefly characterized as follows: Body slender, rather long. Head together with the eyes narrower than pronotum; vertex more or less elongate, slightly converging to apex, somewhat rectangular, and produced from one-fourth to two-thirds its length beyond the eyes; frons long and narrow, slightly broader at apex than at base, tricarinate. Eyes more or less compressed, not deeply emarginate below. Antennæ rather short, first segment shorter than the second, the latter usually somewhat tuberculate. Thorax slender; lateral carinæ usually attaining the hind margin; scutellum tricarinate. Calcar tectiform, the margins usually rather close together with pubescence between. Female ovipositor sheath subcylindrical, often broadened or foliaceous and appressed to genital segment. Probable type of genus is *Stenocranus minutus* Fab.

From the present study it seems that the final criterion for specific determination in most of the species is an accurate figure of the male genitalia. This character is constant within the species and quite distinctive.

Figures I and II are the work of Wm. P. Osborn of Syracuse University.

KEY TO THE SPECIES OF STENOCRANUS.

1. Calcar usually large and foliaceous; vertex much produced beyond eyes....2
   Calcar not unusually large, seldom foliaceous; vertex shorter.....3
2. Frons pale, with a brown band below antennæ; first antennal segment only a little shorter than the second.....*palaetus* V. Duzee
   Frons without band; first antennal segment about as long as the second, *longicornis* Dozier
3. Female ovipositor sheath broadened conspicuously, not styliform or cylindrical.....4
   Female ovipositor sheath more or less cylindrical, at least on apical two-thirds.....8
4. Frons narrowed above, sides subparallel from ocelli to apex; vertex not produced more than one-third its length beyond eyes.....5
   Frons broadest at apex, sides uniformly diverging from base; female ovipositor sheath less foliaceous, narrower.....7
5. Vertex not more than one and a half times as long as broad posteriorly; frons usually less than three times as long as broad.....6
   Vertex at least twice as long as broad; frons narrow, fully three times as long as broad, or more, black between carinæ.....*angustus* Crawford
6. Female ovipositor sheath broadly elliptical, broadest midway; frons usually black between carinæ.....*dorsalis* Fitch
   Female ovipositor sheath slightly narrower, broadened apically, not as closely appressed as in *dorsalis*.....*vittatus* Stal
   Female ovipositor sheath broadest apically, pyriform; frons pale brown between carinæ; vertex and frons relatively shorter.....*felti* V. Duzee
7. Vertex produced considerably more than half its length before eyes, beak-shaped, fully four times as long as broad.....*rostrifrons* Crawford

8. Male pygofer rather long and narrow, with ventral margin deeply and acutely angled emarginate; genital styles long and slender. . *breviceps* Dozier
Male pygofer comparatively small; genital styles large at base, narrowing only slightly beyond middle and enlarging distad, with inner tip pointed, *croceus* Van D.
Male pygofer medium sized, excavated into a large median spur and two lateral ones; anal tube with a long sharp median process on ventral margin..... *hinei* Dozier
Male pygofer large, ventral margin roundingly emarginate; anal tube long, produced ventrad into two much longer processes than in *dorsalis;* genital styles large, constricted one-third of length from base, distal third converging to acute apex..... *similis* Crawford

Stenocranus dorsalis Fitch.
(1851 Homop. N. Y. St. Cab., p. 46).

Many species bear a close resemblance to *dorsalis* and are often confused with it on superficial examination. The genitalia are quite distinct and characteristic in both sexes and afford the most sure means of specific determination.

Head narrower than pronotum, strongly carinate. Vertex long and narrow, about one and a half times as long as broad posteriorly, produced about one-third its length beyond the eyes. Front long and narrow, narrowed above, slightly but quite abruptly broadened to ocelli, thence parallel to apex; median carina sometimes forked a little below apex of head. Antennæ rather short, the second segment three times as long as the first. Pronotum moderately long, scarcely as long as the vertex, lateral carinæ arcuate, attaining the hind margin. Scutellum about twice as long as pronotum, tricarinate. Elytra long and narrow. Calcar large, half as long as the basal tarsus, somewhat pubescent.

General color light yellowish-brown to brown, the dorsum usually with a long whitish vitta that extends from the vertex to the tip of scutellum and is continued by the whitish margin of the clavus when the elytra are closed; this vitta is variable in distinctness and width. Front and clypeus with the intra-carinal spaces black. Antennæ pale. Elytra usually subhyaline, light brown, occasionally darker, with a more or less prominent brown macula along membrane slightly behind middle and often extending somewhat on to corium. Sexes similar in coloration. Legs pale; femora and tibiæ striped with fuscous.

Female ovipositor sheath greatly broadened, foliaceous, closely appressed to and entirely covering genital segment, elevated on margins, and often covered with floccous secretion.

Male pygofer large; anal tube with two long, acute processes on ventral margin; genital styles large at base, abruptly narrowed midway, thence deeply emarginate, sinuate, acute at tip.

Length of body, 2.50–3 mm.; length to tip of elytra, 4.50–5 mm.

Redescribed from a large series from many states. This is our most common and most widely distributed species of the genus, being found abundantly on sedges over most of the United States and Canada.

Stenocranus vittatus Stal.
(1862 Berliner Ent. Zeits., VI, p. 315).

This species, described from Carolina and Pennsylvania by Stal as *Delphax vittatus*, has not since been recognized. I have on hand a single female, collected at Gainesville, Fla., by the writer in 1917, a series of four females and two males collected by C. J. Drake at the same locality, May 5, 1918, one male from Hattiesburg, Miss., Aug. 10, 1921, and a series of two males and a female taken by the writer sweeping grass and sedges in a swamp near Meridian, Miss., Aug. 14, 1921, that I place as this species.

Although very strongly resembling *dorsalis* and probably long confused with that species, it is quite distinct and is easily distinguished by its smaller size and the shape of the male genital styles.

Identical in structure and wing venation with *dorsalis*. General color darker brown with the median white dorsal vitta very distinct itself and made very prominent by the deeper fuscous of the pronotum, scutellum and elytra. Intra-carinal spaces of front and clypeus dark fuscous. Antennæ pale. Elytra of a much darker fuscous on corium than in *dorsalis* and there is a dark brown macula towards apex, with the apical nervures prominently infuscated. Tergum of female marked with fuscous and red, darker in male. Femora and tibiæ lineated with fuscous.

Female pygofer pale fuscous, broad, foliaceous, greatly resembling that of *dorsalis*, but broadest apically and not so closely appressed to the genital segment.

Male pygofer fuscous, comparatively smaller than in *dorsalis;* genital styles broad at base, abruptly narrowed almost midway, thence deeply emarginate, and then roundingly drawn out to acute tip; anal tube with two acute lateral processes on ventral margin.

Length of body, 2.25 mm.; length to tip of elytra, 3.50–4.25 mm.

I include here the original description in Latin and a translation of the same:

"*Delphax vittata* Stal.—griseo-straminea, supra infuscata; fronte clypeoque fuscis, pallido-carinatis; vitta verticis thoracis scutellique nec non commissura pure stramineis; tegminibus fuscescentibus apicem versus obscurioribus, maculis duabus parvis marginis commissuralis prope apicem, parteque lata costali subvinaceo-hyalinis, venis transversis apicalibus hujus partis fuscis et fusco-marginatis; capite modice prominente. ♀. Long. cum tegm. 5 millim.

"Patria: Carolina meridionalis et Pennsylvania. (Mus. Holm.)."

Delphax vittata Stal.—gray-stramineous, infuscated above; frons and clypeus fuscous, palely carinated; the vitta on vertex, thorax, and scutellum bright stramineous and also the commisure, stramineous. Tegmina fuscous, rather obscure towards the apex, with two small

spots on the commisural margin near apex, and a wide part of the costa somewhat wine-colored-hyaline, transverse apical veins of this part fuscous and margined with fuscous. Head moderately prominent. Female. Length with tegm. 5 mm.

Country: South Carolina and Pennsylvania. (Mus. Holm.).

Stenocranus felti Van D.
(1910 Trans. Am. Ent. Soc., xxxvi, p. 88).

Closely allied to *dorsalis*, differing principally in having the apex of the vertex broader and more rounded, the front proportionately broader and shorter, and the pygofer of female is much broader apically and almost pyriform.

Head decidedly narrower than the pronotum. Vertex produced about one-third its length beyond the eyes, carinæ distinct. Front long and narrow, sides subparallel, narrowed towards base tricarinate. Antennæ with second segment about three times as long as the first; seta short. Pronotum as long as the vertex, tricarinate, the lateral carinæ attaining the hind margin. Scutellum short, about one and a half times as long as the pronotum, tricarinate. Elytra comparatively very short and broad and are held in a more or less roof-shaped position. Calcar slender.

General color a soiled yellowish-testaceous with the carinæ a little paler and the dorsum marked with a whitish vitta from near the front of the vertex to the tip of the scutellum, which is continued by the pale commisural nervure of the closed elytra. Front with the intra-carinal spaces pale brown or almost concolorous. Basal segment of antennæ with a black mark inferiorly, a similar mark on the cheek below the ocellus, and the antennal socket has a distinct black marginal spot anteriorly. Venter in the male black with the segments edged with orange. Elytra in the female pale yellowish hyaline with the nervures a little darker, sometimes becoming almost black on the clavus and inner margin of corium; the second apical nervure and the apex of the others deep black. In the male the nervures are almost entirely blackish fuscous, and the black of the second apical nervure is spread over the adjoining areole. Legs lineated with fuscous.

Female ovipositor sheath broadest apically, pyriform, fuscous, foliaceous, closely appressed to and covering the genital segment; anal style large and fuscous.

Male pygofer light brown in color, base fuscous, large, with ventral margin roundingly excavated; genital styles reddish-brown, large at base and pointed on either side about middle, then roundingly and abruptly emarginate, narrowed and drawn out to an acute tip; anal tube with a sharp, reddish-brown tooth each side.

Length of body 3 mm.; length to tip of elytra, 4–5 mm.

Redescribed from a series of males and females taken at Cranberry Lake, N. Y., July 5, 1917, by C. J. Drake, and a

female from Orono, Maine, taken May 31, 1914, by H. M. Parshley. Also known from New Hampshire. This species occurs in low wooded swamps and bogs.

Stenocranus similis Crawford.
(1914 Proc. U. S. Natl. Mus., xlvi, p. 591, two figs.)

Female of similar color and about the same size of *dorsalis* which it very closely resembles superficially. The usual white vitta is seldom or indistinctly present.

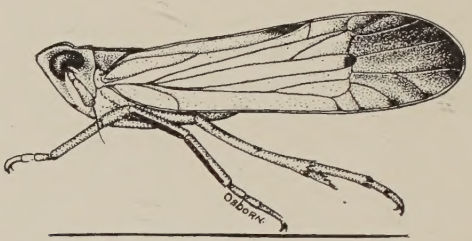


FIG. 1. Female of *Stenocranus similis*

Head narrower than pronotum. Vertex long, wider at base and narrowed towards the apex, produced about one-third its length beyond the eyes, carinæ distinct. Frons long and narrow, tricarinate. Second antennal segment three times as long as first; seta fuscous, twice the length of the second segment. Pronotum slightly shorter than vertex, tricarinate, the lateral carinæ well-rounded and attaining the hind margin. Scutellum over one and a half times as long as pronotum, tricarinate. Calcar large, but rather slender.

General color light yellowish-brown with the usual white dorsal vitta generally missing or very indistinct. Intra-carinal spaces of front and apex of vertex light to dark fuscous. Antennæ pale. Eyes pale yellowish-brown to fuscous. Elytra subhyaline, usually light yellowish-brown, a fuscous spot on inner margin at junction of claval and commisural veins; radio-medial cross-vein and apical ones at their tips, infuscated. In the male the tip of the elytron, beginning with the cross-veins, is deeply infuscated, forming a large round spot. Abdomen pale in female, more infuscated in male. Legs lineated with fuscous.

Female genital segment longer and narrower than in *dorsalis;* ovipositor sheath not foliaceous, cylindrical and extending almost to tip of abdomen.

Male pygofer large; anal tube long, produced ventrad into two much longer processes than in *dorsalis;* anal style short; genital styles large, constricted one-third of length from base, distal third converging to acute apex.

Length of body, female, 3 mm.; male, 2.75 mm.; length to tip of elytra, female, 5 mm.; male 4.25 mm.

Redescribed from a large series of males and females collected in Mississippi by the writer at Aberdeen, June 26, 1921, Columbus, June 23, 1921; Tupelo, July 2, 1921; Fulton, July 4, 1921; and Rokeena, July 20, 1921; and two females taken at Clemson College, S. C., by G. G. Aineslie. These were all swept in abundance from cane-brake and the only definitely known host plant is the bamboo-cane, *Arundinaria tecta.*

Stenocranus palaetus Van D.
(1897 Bul. Buf. Soc. Nat. Sci., v, p. 232).

Form and size of *dorsalis.* Distinguished by its long vertex and large, foliaceous tibial spur and banded frons.

Head decidedly narrower than pronotum. Vertex extended half its length beyond the eyes, carinæ prominent except median one, which is faint. First antennal segment a little shorter than the second. Pronotum slightly shorter than the vertex, strongly tricarinate, the lateral carinæ attaining the hind margin. Scutellum one and a half times as long as pronotum, tricarinate, the lateral carinæ rather indistinct. Calcar unusually large and foliaceous.

Color is fulvous yellow above, paler beneath. Frontal fovæ interruptedly black over the apex of the head from the base of the antennæ to the middle of the vertex; front crossed by a brown band below the antennæ, and another crossing the base of the clypeus and extending over the anterior coxæ and pleural pieces; apex of front and its median carina interruptedly pale. Antennæ somewhat fuscous. Eyes black. Elytra subhyaline, nervures yellowish, the commisural white with a brown line before the apex of the clavus; inner sector of the corium and the apical nervures, except the base of the two outer, fuscous; a smoky cloud covers the anastomosis at the base of the middle apical areole and spreads feebly over the inner area of the membrane. Tergum brownish. Legs pale, femora lineated and the tibiæ banded with fuscous.

Female genitalia typical. Male pygofer trilobate, middle lobe with a somewhat semicircular median notch, each side of which is extended tooth-like; lateral lobes, genital styles, and anal style dark fuscous; anal tube without ventral processes.

Male slightly smaller than female, with slightly shorter vertex; otherwise similar in appearance.

Length of body, male, 2.75 mm.; female, 3.50 mm.; length to tip of elytra, male, 4 mm.; female, 4.9 mm.

Redescribed from two males and two females taken at Gainesville, Fla., May 5, 1918, by C. J. Drake; one female

from Perkinston, Miss., taken June 25, 1921, by F. H. Benjamin; and a female from Ocean Springs, Miss., June 28, 1921.

Nothing is known of its food plant or habitat.

Stenocranus longicornis sp. nov.

Very closely allied to *S. palætus* both in general appearance, large tibial spur, and genitalia but differentiated at once by the very long antennæ and distinct male genitalia.

Vertex proportionately long, produced beyond the eyes slightly more than a third its length, carinæ distinct. Front very long, narrowest between the eyes, enlarging below. Antennæ long, the first segment about as long as the second. Tibial spur unusually large. Pronotum shorter than the vertex, distinctly tricarinate with the lateral carinæ attaining the hind margin. Scutellum about twice the length of pronotum, tricarinate.

General color dark brown. Vertex, pronotum and scutellum dark piceous, whitish along median carina. Front and clypeus dark with edges of carinæ paler. Second antennal segment light brown, first segment paler. Eyes brown. Elytra subhyaline, nervures prominent, fuscous. Tergum fuscous with genitalia paler. Legs pale, faintly and indistinctly lineated with fuscous.

Male pygofer trilobate, lateral lobes curved around behind, ventral margin of median lobe roundingly emarginate with a large hairy lateral tooth each side; pygofer pale brown with the drawn out base darker; genital styles rather short and stout, dark; armature of diaphragm produced in two long teeth; aedeagus apparently forked.

Length of body 2.75 mm.; length to tip of elytra, 4 mm.

Described from a single male, taken at light trap at Ocean Springs, Miss., Aug. 3, 1921, by the author. I do not hesitate to describe this species from a single specimen as it is quite distinct.

Type in author's collection.

Stenocranus breviceps sp. nov.

In general appearance of female quite similar to *dorsalis* and *angustatus* but easily distinguished from these and the other members of the genus by its short and very broad vertex, the comparatively long elytra, well rounded at the tips and distinct male genitalia.

Head slightly narrower than prothorax, vertex short, somewhat rectangular in shape, produced about one-fourth of its length beyond eyes, strongly carinate. Frons one-third as broad as long, narrowed above, distinctly carinate. Antennæ rather short, second segment

three times as long as first. Pronotum long, proportionately broad; carinæ on account of their whitish color are indistinct, the lateral ones not attaining the hind margin. Elytra long, narrow, enlarging towards the apex, well rounded at tips. Legs slender; calcar typical, slender, pubescence slight.

General color light yellowish-brown to brown. Dorsum with more or less distinct whitish vitta, continued by the pale commisural nervure of the closed elytra. Carinæ of vertex, front and clypeus whitish with intra-carinal spaces black. Distal end of basal segment of antennæ with black mark, a similar mark on the cheek below the ocellus. Pronotum for the most part of a pale whitish color, a fuscous band bordering each side of the median white vitta, and fuscous markings at sides of pro- and mesonotum. Scutellum whitish. In the female the elytra are of a uniform pale yellowish to brown hyaline, with nervures whitish. In the male the inner half of the elytra below the commisural nervure is more deeply enfumed; the tip of the elytron beginning with the transverse veins is deeply infuscated, forming an almost round apical dark area within which the nervures are fuscous.

Female ovipositor sheath longer and narrower than in *dorsalis*, pale in color, the ovipositor fuscous.

Male pygofer rather long and narrow, with ventral margin deeply and acutely angled emarginate; genital styles long and slender, stouter at base.

Length of body, female, 3 mm.; male, 2.5 mm.; length to tip of elytra, female, 5 mm.; male 4.25 mm.

Described from a series of ten females and five males taken by the writer sweeping sedges and marsh vegetation at Moss Point ferry across Pascagoula River, Pascagoula, Miss., Aug. 8, 1921.

Holotype and allotype in author's collection. Paratypes deposited in U. S. National Museum and collections of the State Plant Board of Mississippi. Prof. Herbert Osborn and Z. P. Metcalf.

Stenocranus croceus Van D.

(1902 Bul. Buf. Soc. Nat. Sci., v, p. 233).

Closely allied to *dorsalis* but very much smaller, of a general yellowish-orange appearance, and the front is shorter and wider.

Vertex short, produced beyond the eyes about one-third its length, carinæ distinct. Front long, rather broad, narrowing gradually to base and slightly rounded to clypeus, tricarinate. First antennal segment one-third as long as second. Pronotum as long as vertex, tricarinate, carinæ attaining hind margin. Scutellum about twice as long as pronotum, tricarinate.

General color pale yellowish-orange, although slightly more sordid in some specimens. Vertex, pronotum and scutellum yellowish-orange or sordid yellow, with whitish band along median carina. Front and clypeus yellowish-orange with pale area along each side of median carina. Antennæ pale. Eyes brown. Elytra subhyaline, nervures, especially the commissural one, pale. Tergum yellowish-orange. Legs pale, without markings; tarsal claws piceous; calcar typical, large and distinctly dentate.

Female ovipositor sheath narrower than in *dorsalis*, and not foliaceous; not closely appressed to nor entirely covering the genital segment; pale orange-yellow with the ovipositor itself darker.

Male genitalia in single specimen on hand obscure. Pygofer fairly large, ventral margin roundingly emarginate; genital styles quite different from those of *dorsalis*, large at base, narrowing only slightly beyond middle and enlarging distad, with the inner tip pointed.

Length of body, 2.50–3 mm.; length to tip of elytra, 3.75–4.75 mm.

Redescribed from a single mutilated male and a female from Devil's Lake, N. D., two females from Brookings, S. D., one female from Delphos, Kan., and two females from Springer, N. Mex., all collected during July, 1909, by Prof. Herbert Osborn, and a large series of both sexes from Portland, Maine, August 13, 1913, H. Osborn.

Stenocranus hinei, sp. nov.

Resembles *breviceps* superficially but is smaller, the legs unmarked and the male genitalia quite distinct.

Head slightly narrower than pronotum. Vertex short, produced beyond the eyes about one-fourth its length, carinæ rather indistinct, especially the median one, which is almost obsolete. Front long and narrow, narrowing to base, one-third as broad as long, tricarinate. Antennæ with second segment three times as long as the first; seta fuscous, three times as long as the second segment. Pronotum not quite as long as the vertex, tricarinate, with the lateral carinæ almost attaining the hind margin. Scutellum tricarinate. Elytra long and narrow. Legs slender; calcar typical, long and slender.

General color pale yellowish-brown with whitish median vitta, this vitta accentuated by the fuscous stripes bordering it on the pronotum and scutellum. Frontal carinæ whitish with the spaces between dark fuscous. Genæ dark fuscous next to the lateral carinæ of front, whitish beyond to antennæ. Antennæ pale, unmarked. Eyes light brown. Elytra in both sexes pale soiled yellow to hyaline brown with the commisural nervure whitish; nervures pale, becoming brown in ante-apical cells; radio-medial cross-nervure and anteapical nervures at tips, infuscated. Legs pale, unmarked.

Female ovipositor sheath long, somewhat foliaceous, extending beyond tip of abdomen, sides subparallel.

Male pygofer medium in size, excavated into a large median spur and two longer lateral ones; anal tube with a long, sharp median process on ventral margin; genital styles rather long, larger at base, narrowing in middle, much enlarged, retorsed, and cut off distad, very pale in color; aedeagus of dark fuscous chitin, composed of three parts, the ventral one rather stout, sharp, and barbed, the middle one thorn-like, very long and sharp, the upper one short and stout with a pair of curved hooks at tip.

Length to tip of elytron, male, 4 mm.; female, 4.75 mm.

The male is similar to the female in coloration and markings, but is smaller.

Described from a series of nineteen males and fourteen females, taken sweeping at swamp edge, Los Amates, Guatemala, Jan. 17, 1905, by Prof. J. S. Hine, after whom I name the species.

Holotype and allotype in collection of Prof. Herbert Osborn as well as those paratypes not otherwise designated. Paratypes in U. S. National Museum and in the collections of Z. P. Metcalf and the author.

Stenocranus angustus Crawford.

(1914 Proc. U. S. Natl. Mus., xlvi, p. 589).

As I have not seen the original type specimen I am including here the original description.

"Length of body, 3.1 mm.; width of vertex, 0.20; width of frons, 0.22; antennæ, I, 0.05; II, 0.22. General color brown or dark brown, dorsum with conspicuous white vitta; frons black between carinæ; femora striped black; elytra mostly dark brown except outer anteapical and costal cell and small part of membrane light.

Vertex about as long as in *dorsalis*, projecting about one-third its length before eyes, about twice as long as broad; frons one-third as broad as long, slightly narrowed at ocelli.

Thorax slender; prothorax not much broader than head; scutellum long. Calcar slender. Elytra long and very slender.

Male genitalia somewhat similar to *dorsalis;* styles more slender and delicate, very acute and slender distad.

Described from one male, taken at Belize, British Honduras, by J. D. Johnson. This species is similar in many respects to the northern *S. dorsalis*.

Type-specimen.—In collection of Pomona College, Cal."

Stenocranus rostrifrons Crawford.

(1914 Proc. U. S. Natl. Mus., xlvi, p. 591, two figs.)

"Length of body, 3.6 mm.; width of vertex, 0.20; length to apex of head, 0.72; width of frons, 0.21; antennæ I, 0.07; II, 0.21. General color yellowish orange; frons with a slender black stripe near apex of above; antennæ lineated narrowly with black beneath or in front.

Head long, narrower than prothorax, strongly carinate between eyes, produced almost two-thirds of its length beyond eyes, curved down somewhat and resembling very closely a bird's beak, acute at apex; vertex very elongate, narrow, about four times as long as broad, narrowed anteriorly; median carina almost wanting; frons elongate, broadest below, not strongly carinate; eyes rather small; ocelli conspicuous. Antennæ not as long as width of head between antennal sockets, II about three times as long as I.

Thorax slender, long, not strongly carinate; pronotum about two and a half times as long as scutellum, broadly emarginate behind. Calcar typical, pubescence slight. Elytra long, strongly attenuate at base, more rhomboidal apically than in congenors, maculate on membrane veins; venation somewhat different from that of congenors.

Female ovipositor sheath somewhat broadened, about midway between foliaceous and cylindrical.

Described from one female from Habana, Cuba (Baker). Type-specimen.—In collection of Pomona College, Cal."

Stenocranus maculipes Berg.

(1879 Hemipt. Argentina, p. 223).

This species was placed in the genus *Delphax* by Berg but without question should be assigned to *Stenocranus*, at least until again recognized. I am including here a translation from the original Latin description:

"Female: Fuscous, here and there variegated with testaceous, elytra and legs testaceous, the former with fuscous veins, and infuscated at interior margin, the latter obscurely spotted and banded with fuscous; hind part of head narrower than pronotum, produced beyond the eyes; vertex longer by half than its basal width, somewhat narrowed upwards, margins strongly elevated, median carina lacking, the two lateral carinæ meeting at an acute point; frons and clypeus tricarinate, the former scarcely curving on both sides before the middle, then very slightly widened towards apex, banded with white in front of the middle and at apex; clypeus white at base; first antennal segment somewhat compressed, second somewhat longer and more slender, the latter strongly tuberculate, above and below a little dilated; pro- and mesonotum obscurely fuscous, tricarinate, the former widened behind, carinæ distinct, rather pale, the latter with lateral carinæ somewhat obsolete,

median carina extended all the way to apex of scutellum; elytra much longer than abdomen, subhyaline, all veins and the interior margin partly infuscate; wings hyaline; dorsum and venter of abdomen fuscous; greater part of femora blackish-brown, tibiæ with two blackish bands, hind ones bispinose in front of the middle; tarsi light yellowish, partly fuscous. Length of body, 4½ mm.; elytra, 4½; width of meson, 1 mm.

"Country: Province of Buenos Ayres."

Of this species I received from Sr. Ed. Lynch Arribalzaga, one individual that was collected in Rio Lujan during the month of February, 1879.

A comparative study of the male genitalia of the members of this genus show that *dorsalis*, *vittatus*, *felti*, *angustus*, *similis*, and *croceus* are very closely related to each other. *Palætus* and *longicornis* on the other hand form an entirely distinct type of development with the pygofer more or less trilobate. *Breviceps* shows a third type in which the ventral margin of the pygofer is deeply and angularly emarginate. *Hinei* is the sole representative of a fourth type having the pygofer formed of a median and two lateral large teeth and with a single median anal process. *Rostrifrons* is known from a single female and therefore no comparison can be made of the male genitalia.

The relation of these species to one another as shown in a study of the genitalia is borne out by the external structure.

The Genus Mysidia Westwood.

Many of the members of this genus closely resemble certain small whitish Geometrid moths. They run very swiftly on the upper surface of leaves or when caught in a net, with their wings partially raised. The genus is tropical, at least nine species occurring in Central America and nothing is known of their life-history. Heretofore no species has been known from North America.

For the most part members of this genus are of a white more or less opaque color; the head is narrow and compressed; the antennæ have the first joint short, the second large and swollen, more or less pointed or truncate, the third consisting of a fine seta; the tegmina are very long and rather narrow, much larger than the wings, both vitreous, with the veins very light in color with occasional more or less obscure markings. One of the best characteristics of the genus is the large number of long, narrow, and very regular apical areas.

Mysidia mississippiensis, sp. nov.

Technical description.—Head, antennæ, pronotum and scutellum yellowish, covered more or less with whitish powder, abdomen with greenish tinge; abdominal plates meet in a median ridge; head very narrow, compressed, distinctly produced before the eyes and plainly longer than the pronotum; eyes dark brown; pronotum narrow with sides flaring-like. Tegmina and wings translucent, of a milky-white color, venation distinctly but not strongly marked; tegmina long and rather narrow, with very light fuscous areas especially along the transverse veins and a distinct fuscous patch near middle of the posterior margin of tegmina. Legs very slender, testaceous.

Length of body, male, 2.50 mm.; female, 3 mm.; wing expansion, male, 15 mm.; female, 17 mm.

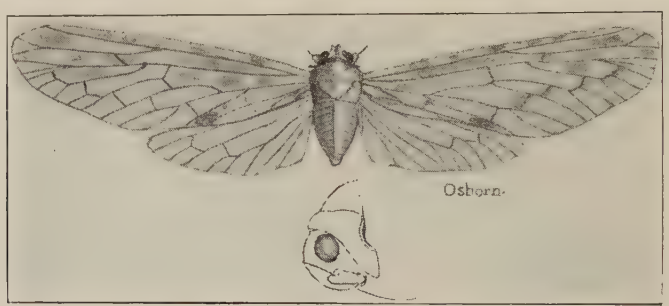
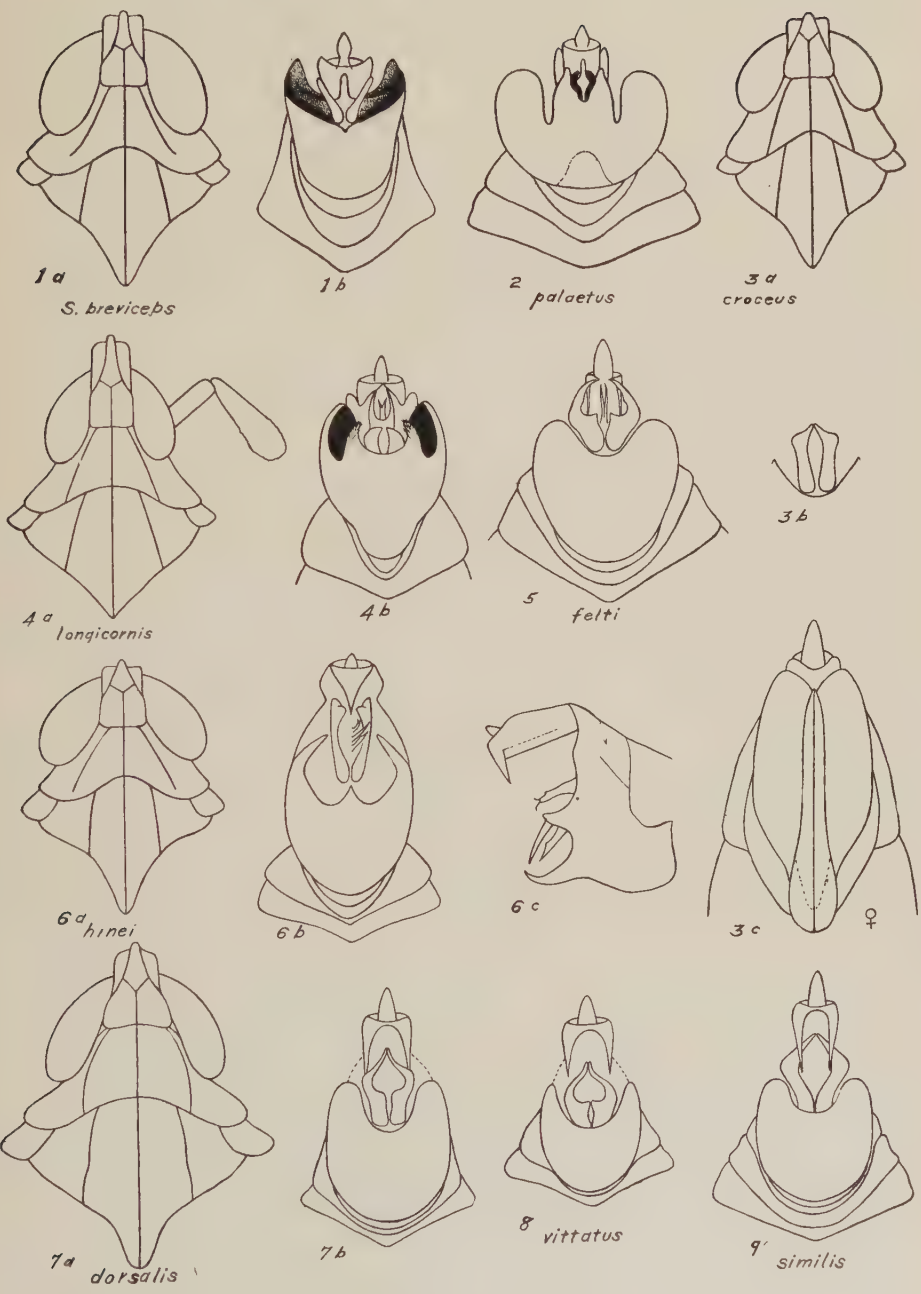


Fig. 2. *Mysidia mississippiensis*

Described from a single female taken by the writer sweeping *Arundinaria* and grass in Oktibbee Swamp near Meridian, Miss., Aug. 14, 1921, and a series of two females and a male taken in a swamp near Leland, Miss., Sept. 15, 1921, by C. J. Drake.

Type in the author's collection. Paratypes deposited in collections of Prof. Herbert Osborn, Z. P. Metcalf, and the State Plant Board of Mississippi.



H. L. Dozier, del.

THE HOMOLOGIES OF THE TRACHEAL BRANCHES IN THE RESPIRATORY SYSTEM OF INSECTS

CLARENCE HAMILTON KENNEDY
Department of Zoology and Entomology, Ohio State University

The following study of the tracheation of the Zygoptera was undertaken to determine the homologies of the tracheal branches that supply parts of the genitalia of the second and third segments of the male. This full investigation will eventually appear in one of the government publications but the study brought to light points of so much greater importance that a discussion of these was given at the Toronto Meetings of which this article is the outline.

Grassi* has shown the probability that the insect tracheal system was originally a series of disconnected segmental systems which later fused into a connected whole.

Chapman† has homologized the main thoracic tracheæ which form the main air supply of the wings in the various orders of insects, and has shown us that the tracheal system can be homologized but so far no attempt has been made to refer these back to the more generalized (?) plan found in the tracheation of the abdominal segments. In the majority of the general morphological works on insects the tracheal system is described as being composed of certain longitudinal trunks with various accessory parts in the way of spiracles, air sacs, cross-connections, etc. This is true, but these are not descriptions which take into consideration the origin and homologies of the individual parts of the tracheal system.

The Zygopterous naiad, among the nymphs, of all winged insects, appears to have the abdominal segments least modified from a probable primitive condition. Its abdomen is clyindrical, therefore no parts are displaced or lost by depression. Its gills are at the apex of the abdomen, therefore their position does not modify any but the caudal parts of the system. The abdomen is elongate so that each segment can be studied individually.

* Atti dell' Accad. Groenia d. Sci. Nat. Catania (3) T. XIX. 1885.

† In "Wings of Insects," Comstock, pp. 27–51.

The nymph of *Lestes*, which furnished the material for this study, is so abundant and so transparent that little dissection was needed.

In this article the writer will outline the homologies of the principal thoracic tracheal branches as referred back to the simpler system of an individual abdominal segment. The terms used are descriptive as far as possible and were worked out with the help of Dr. Chapman with the hope that we had terms that would be useful in future tracheal studies.

If the reader will refer to the plate he will see in Fig. 1 the simplest tracheal unit in abdominal segment 2. It is repeated in segments 3–7. Segments 1 and 8–10 have more or less modified versions of this same unit. In the thorax the tracheal branches are yet more highly modified. The diagram Fig. 3, shows what the writer considers as the hypothetical primitive unit from which the present system with its longitudinal trunks has been developed.

The studies of the primitive tracheal systems in *Peripatus* and in the embryology of the insectean tracheal system show that the spiracles develop first as pits. From the bases of these pits the tracheal branches develop. Our unit starts then with (1) the *spiracle*, sp., extending into the body wall, (2) is the *spiracular* pit, spp. From the bottom of this there develops dorsad a short stout branch, (3) the *spiracular trunk*, spt. This trunk forks and sends a branch, (4) the *anterior dorsal connective*, adc. to the muscles of the anterior end of the segment, and a branch (5) the *posterior dorsal connective*, pdc. to the posterior muscles of the dorsum of the segment. Each of these has a branched tip supplying its group of muscles, (6) (7) the *tip* of the *anterior dorsal connective*, tadc, and the *tip* of the *posterior dorsal connective*, tpdc. These tips become landmarks later in the study.

The *spiracular pit* sends out three other branches, (8) *the anterior spiracular connective*, asc, which connects forward to the leg trachea and which gives off a small branch to the body wall, (9) *the posterior latero-tergal trachea*, plt. Opposite to this (8) is given off a larger trachea, (10) *the leg trachea*, lt, which runs caudad and ventrad. It gives off first, (11) *the anterior latero-tergal trachea*, alt, to the body wall, then (12) *the pleural trachea*, pt, to the pleural fold. Ventrad the spiracular pit gives

off a slender branch direct to the ganglion of the segment (13) the *ganglionic trachea*, gt. This has a tip which runs along the sternum caudad from the ganglion, (14) *the sternal trachea*, st.

As this hypothetical unit is derived from the tracheal system as it appears in the less modified abdominal segments these terms are directly applicable to the parts in Fig. 1. In this figure it will be seen that the anterior and posterior dorsal connective have united as they alternate along the dorsum into a large dorsal trunk. In *Lestes* it is especially large as it functions with its mate of the opposite side, as a swim bladder, while along it at regular intervals are the *tips* of the *anterior and posterior* dorsal connectives.

In the front end of the abdomen the ganglions of segments 1 and 2 have each moved cephalad one segment. In each case the *ganglionic trachea* has followed its ganglion cephalad. The ganglion of segment 1 fuses with that of the metathorax but the elements of the tracheal supply are still recognizable. See Fig. 2, which is a ventral view of the thorax.

In each segment the *anterior spiracular connective* has fused with the *leg trachea* next ahead so that in the abdomen there is a delicate but complete lateral trunk. In the thorax a pair of ventral or sternal trunks appear by the fusion of the *sternal tracheæ* with each succeeding *ganglionic trachea*. This fusion is not completed in the abdomen. See Fig. 2.

In the thorax but two spiracles persist, the mesothoracic and the metathoracic. Of the prothoracic spiracle, some of the tracheal branches are present which would be expected with it but the spiracle itself has left no recognizable trace. The tracheal system of the metathorax is least modified. Here the spiracular trunk is still fully developed. In the mesothorax the spiracle has moved dorsad until the *spiracular trunk*, st, has been obliterated. It is also entirely lost for the prothorax.

The modification of the thorax due to the development of the wings has profoundly changed the proportions of the other thoracic branches also. In a later paper the writer will trace this change from the first instar where it is very similar to the abdominal tracheal system through its development to the extreme modification shown in Fig. 1 which is a tenth instar naiad.

The wings start as simple pleural folds no wise different from those of the abdomen. By the fourth instar those of the

thorax have moved dorsad and those of the mesothorax and metathorax have begun to take on the place and shape of wing pads. The simple *pleural trachea*, pt, tracheates them in the beginning and follows them as they pass from the lateral to their final dorsal position. The *pleural trachea* is the anterior or costal wing supply and is the original wing supply as this devlopment shows. As the wing folds (later, pads) pass dorsad they pass the *tips* of an *anterior* and a *posterior dorsal connectives* in each segment and take on connections with these. Also the anal apex of each wing trachea (*pleural trachea*) connects also with the *anterior latero-tergal trachea* of the succeeding segment. Thus each wing in *Lestes* has four tracheal connections.

Several puzzling shifts and specializations have taken place. In segment 1 the leg branch is lost and the *anterior spiracular connective* has shifted from the spiracle down onto the *ganglionic trachea*. This has occurred also in the second and third thoracic segments so that the *posterior latero-tergal trachea* in each case has shifted to arise from near the spiracle.

In the metathorax the *metathoracic tip* of *the posterior dorsal connective* has shifted down onto the vertical *spiracular trunk*. This conclusion is arrived at by elimination of the other *tips*. This solution homologizes the tracheation of the hind wing with the tracheation of the front wing.

In the thorax the *ganglionic trachea* have shifted down onto the *leg trachea* in each segment, and in each segment a second or *accessory ganglionic trachea*, agt, has appeared.

The shortening of the *spiracular trunk* in the mesothorax has pulled the *leg trachea* of the prothorax out of shape and has greatly shortened the *anterior spiracular connective* of the mesothoracic spiracle so that the lateral trunk becomes a second dorsal trunk in the insect's neck.

This work in tracheation is very much confused by malformations and adventitious branches. Frequently there are two or even three *anterior* or *posterior latero-tergal tracheæ*, sometimes two *pleural tracheæ*, etc. One has to examine enough specimens that these abnormalities are recognized as such and no longer confuse. This readiness of the tracheal system to develop new branches has been one of the things which has made homologization of the branches seem a hopeless task.

The tracheation of the internal organs seems to be largely fortuitous except for two large trachea that run from the

metathoracic spiracular trunks to the region of the gut just back of the gizzard and two others that run from the *spiracular trunks* in abdominal segment 8 to the region of the intestine just back of the malpighian tubules. The tracheation of the head is very definite but so far has not been homologized with the parts of the system in the thorax and abdomen unless the tracheæ of the labium can be homologized with *leg tracheæ*.

This study supports the theory that the wings are developed from pleural folds as this feature can be positively homologized from the larval pleural fold stage to the adult winged stage.

The only other order the writer has examined is the Plecoptera. Here the tracheal system is greatly distorted by the thoracic gills and the depressed body. A pair of neural trunks are formed in the abdomen by the fusion of the *sternal tracheæ*. A lateral abdominal trunk is well developed which is probably homologous with the lateral trunk of the Zygoptera though this may be found to be homologous with the dorsal trunk of the Zygoptera. The thoracic trachea are less changed.

The writer believes that this reference of the tracheal branches back to those in a generalized abdominal segment will give a solution to the homolgies of the tracheal systems in the various orders of insects. He hopes soon to carry the study farther.

EXPLANATION OF PLATE.

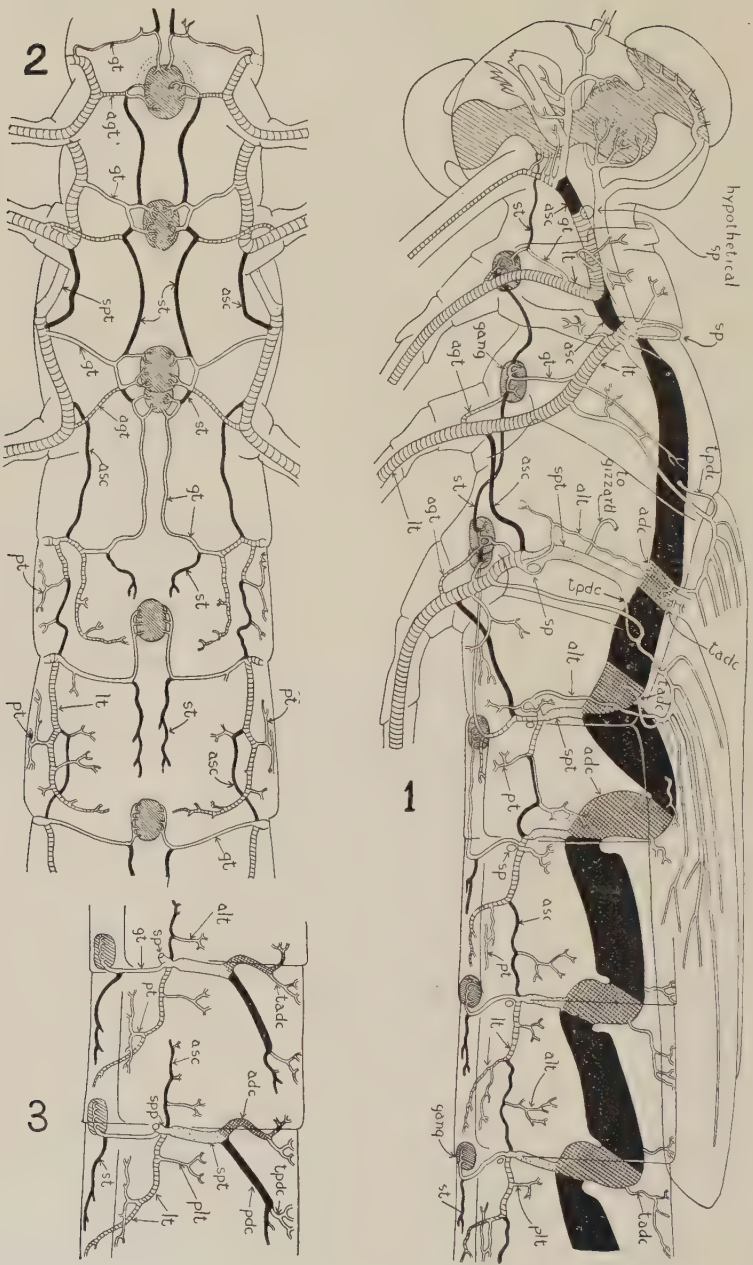
Fig. 1. Lateral view of *Lestes* naiad, male, showing the homologies of the somatic tracheal branches.

Fig. 2. Ventral view of *Lestes* naiad.

Fig. 3. Hypothetical, primitive segmental tracheal organs. By the fusion of a series of such the *Lestes* trachial system may have been developed.

LIST OF ABBREVIATIONS USED IN THE ILLUSTRATIONS.

sp.—spiracle.
spp.—spiracular pit.
spt.—spiracular trunk.
st.—sternal trachea.
dt.—dorsal trunk.
latt.—lateral trunk.
vt.—ventral trunk.
lt.—leg trachea.
pt.—pleural trachea.
gt.—ganglionic trachea.
agt.—accessory ganglionic trachea.
asc.—anterior spiracular connective.
adc.—anterior dorsal connective.
pdc.—posterior dorsal connective.
alt.—anterior latero-tergal trachea.
plt.—posterior latero-tergal trachea.
tadc.—tip of anterior dorsal connective.
tpdc.—tip of posterior dorsal connective.



Clarence H. Kennedy

ADDITIONS TO THE CATALOG OF OHIO VASCULAR PLANTS FOR 1921.*

JOHN H. SCHAFFNER
Department of Botany, Ohio State University

During the past year a number of additions have been made to the Ohio flora and some important extensions of ranges have been detected. Below is given a list of the more important additions, with some corrections of species names.

54. *Equisetum fluviatile* L. Swamp Horsetail. Cedar Swamp, south of Urbana, Champaign Co. John H. Schaffner.

71. *Pinus echinata* Mill. Shortleaf Yellow Pine. Jackson Twp., Jackson Co., Wilkesville and Vinton Twps., Vinton Co. "This pine is generally distributed over N. E. Jackson County, and is the dominant pine with scrub and pitch pines. Its occurrence, however, in Vinton County is rather limited and restricted, occurring always on the ridges." F .W. Dean.

72. *Thuja occidentalis* L. Arborvitae. On east bank of Brush creek, Bratton Twp., Adams Co. Katie M. Roads.

236. *Carex platyphylla* Car. Broadleaf Sedge. Hillsboro, Highland Co. Katie M. Roads.

384. *Sporobolus vaginaeflorus* (Torr.) Wood. Sheathed Rush-grass. Hillsboro, Highland Co. Katie M. Roads.

414. Change name to *Torresia odorata* (L.) Hitchc. instead of *Savastana odorata* (L.) Scrib. Add: Specimens from Blanchester, Clinton Co. "Wet meadows." E. Lucy Braun.

545. *Juncus torreyi* Cov. Torrey's Rush. Hillsboro, Highland Co. Katie M. Roads.

552.1. *Juncoides bulbosum* (Wood) Small. Bulb-bearing Wood-rush. Blanchester, Clinton Co. "Wet meadows." E. Lucy Braun.

567. *Fissipes acaulis* (Ait.) Small. Moccasin-flower. Ironton, Lawrence Co. Lillian E. Humphrey.

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* Papers from the Department of Botany, Ohio State University. No. 132.

662. *Sarracenia purpurea* L. Pitcher-plant. Cranberry Island, Buckeye Lake, Licking Co. Spreading abundantly from a single plant set out several years ago by Miss Freda Detmers. Hundreds of vigorous plants now cover a considerable area of the open Sphagnum bog. John H. Schaffner.

663. *Drosera rotundifolia* L. Roundleaf Sundew. Cedar Swamp, southern part of Clarke Co. Mrs. Bayard Taylor.

683. *Koniga maritima* (L.) R. Br. Sweet Alyssum. "Persistent and an escape from cultivation." Hillsboro, Highland Co. Katie M. Roads.

706. *Sophia pinnata.* (Walt.) Howell. Pinnate Tanzy-mustard. Gravel slide, Huffman Dam, Greene Co. Also in Clark Co. A. E. Waller.

714. *Conringia orientalis* (L.) Dum. Hare's-ear-mustard. Hillsboro, Highland Co. Katie M. Roads.

739. *Dentaria diphylla* Mx. Two-leaf Toothwort. Near Hillsboro, Highland Co. Katie M. Roads.

744. *Sinapis arvensis* L. Corn Mustard. "In waste places and gardens." Hillsboro, Highland Co. Katie M. Roads.

746. *Brassica juncea* (L.) Cosson. Indian Mustard. Hillsboro, Highland Co. Katie M. Roads.

805.1. *Tithymalus falcatus* (L.) Kl. & Garke. Native of Europe. Along railroad between Fairmount and Westwood, near Cincinnati, Hamilton Co. Louis H. Desjardins.

925. *Dianthus armeria* L. Deptford Pink. "In a pasture lot." Hillsboro, Highland Co. Katie M. Roads.

1009. *Potentilla recta* L. Upright Cinquefoil. Roadside near Bainbridge, Ross Co. A. E. Waller.

1286. *Alnus incana* (L.) Willd. Hoary Alder. Cedar Swamp, south of Urbana, Champaign Co. John H. Schaffner.

1323.1. *Opuntia tortispina* Engelm. Twisted-spine Prickly-pear. In large patches in gravel soil in railroad cut, Terrace Park, Cincinnati, Hamilton Co. From the west. E. Lucy Braun.

1420. *Phlox pilosa* L. Downy Phlox. "In pine woods." Ironton, Lawrence Co. Lillian E. Humphrey.

1434. *Convolvulus japonicus* Thunb. Japanese Bindweed. Escaped along a road near Brooks, Clark Co. John H. Schaffner.

1465. *Gentiana crinita* Froel. Fringed Gentian. "In a swamp" near Canton, Stark Co. Mary King.

1471. *Frasera carolinensis* Walt. American Columbo. Blendon and Pleasant Twps., Franklin Co. John H. Schaffner.

1526.1. *Paulownia tomentosa* (Thunb.) Baill. Paulownia. Escaped in Ironton, Lawrence Co. Lillian E. Humphrey.

1529. *Conobea multifida* (Mx.) Benth. Conobea. Hillsboro, Highland Co. Katie M. Roads.

The following changes of names should be made in the family Scrophulariaceae, to agree with the treatment of the Ohio species by Mary A. Taylor in "The Figworts of Ohio," Ohio Jour. Sci. 21:217-239, 1921. The sequence of genera and species should also follow the arrangement given there.

1530. *Gratiola neglecta* Torr. instead of Gratiola virginiana L.

1531. *Gratiola virginiana* L., instead of Gratiola sphaerocarpa Ell.

1547. *Veronicastrum virginicum* (L.) Farw. instead of Leptandra virginica (L.) Nutt.

1551. *Dasistoma macrophylla* (Nutt.) Raf. instead of Afzelia macrophylla (Nutt.) Ktz.

1552. *Aureolaria pedicularia* (L.) Raf. instead of Dasystoma pedicularia (L.) Benth.

1553. *Aureolaria virginica* (L.) Pennell, instead of Dasystoma flava (L.) Wood.

1554. *Aureolaria laevigata* (Raf.) Raf., instead of Dasystoma laevigata Raf.

1555. *Aureolaria flava* (L.) Farw. instead of Dasystoma virginica (L.) Britt.

1686. *Salvia lyrata* L. Lyreleaf Sage. Paint Twp., Highland Co. Katie M. Roads.

1695a. *Plantago aristata* nuttallii (Rapn.) Morris. A peculiar but probably merely a depauperate form of P. aristata. Gallipolis, Gallia Co. R. H. Martin.

1761. *Galium pilosum* Ait. Hairy Bedstraw. Paint Twp., Highland Co. Katie M. Roads.

1777. *Viburnum dentatum* L. Toothed Arrow-wood. "Wet meadows and undrained flats." Martinsville, Clinton Co. E. Lucy Braun.

1778. *Viburnum scabrellum* (T. & G.) Chapm. Roughleaf Arrow-wood. Union Twp., Highland Co. Katie M. Roads.

1786.1. *Triostium aurantiacum* Bickn. Scarlet-fruited Horsegentian. Toboso, Licking Co. E. N. Transeau.

1794. *Lonicera japonica* Thunb. Japanese Honeysuckle. "Collected on the bank of a small pond." Hillsboro, Highland Co. Katie M. Roads.

1873. *Bidens aristosa* (Mx.) Britt. Western Tickseed. Bratten Twp., Adams Co. Katie M. Roads.

1948. *Aster junceus* Ait. Rush Aster. "Wet meadows." Midland, Clinton Co. E. Lucy Braun.

1952. *Aster multiflorus* Ait. Dense-flowered Aster. Omit Gallia Co. from distribution.

1964.1. *Leptilon divaricatum* (Mx.) Raf. Low Horseweed. "Dry sandy soil, roadside." From the west. Winton Place, Cincinnati, Hamilton Co. E. Lucy Braun.

2005.1. *Artemisia ludoviciana* Nutt. Western Mugwort. Established along the interurban track near Brooks, Clark Co. From the west. John H. Schaffner.

2030.1. *Centaurea solstitialis* L. Barnaby's Star-thistle. Archbold, Fulton Co. In alfalfa field introduced with alfalfa seed. John S. Nofzinger. Also at Lima, Allen Co. L. S. Van Natta.

NOTES ON THE FOOD HABITS OF YOUNG OF COTTUS ICTALOPS (Millers Thumb.)

C. L. TURNER
Zoological Labaratory, Beloit College

While the writer was engaged in collecting the fry of the Perch and of the Darters in the vicinity of Put-in-Bay, preparatory to making a study of their food habits a locality was found in which the young of *Cottus ictalops* were fairly abundant.

Around the shores of Buckeye Island there is an abundance of short, thick vegetation, shaded by willows and protected and held together by willow roots. This margin is constantly awash due to the exposed position of the island. The young of Cottus ictalops and of the Fan Tailed Darter (*Etheostoma flabellare*) were found hiding in the vegetation and under the rocks in the vicinity. It was not possible to take the fish in a seine because they were so well protected but a small collection was secured by persistently dragging the vegetation with a flat ended dip net.

About a hundred specimens were taken ranging in size from 12 to 22 millimeters and the stomach contents of thirty-five were examined. The food articles have been arranged in a tabular form showing the proportion of each kind of food eaten by each size of fish.

Although ten different articles occur in the food some of them are almost negligible in quantity and even the youngest fish seem to prefer large, active Amphipods or insect larvæ. In some cases a single insect larva, two-thirds as long as the fish filled the stomach.

The young of most fish subsist on Entomostraca during the younger stages, turning later to specialized and larger foods. In a fish of generalized feeding habits the time during which it takes Entomostraca is known as the period of infancy, a later period when midge larvæ and other minute insect larvæ are used is known as the period of youth, while the stage in which the usual food of the adult is taken is designated as the period of maturity. The period of infancy seems to be entirely omitted

or to be passed over in specimens of less than 12 millimeters in length. In this regard it resembles *Etheostoma flabellare*, which unlike most of the other darters captures large, active food while still very small and if it takes Entomostraca at all it does so only in negligible quantities.

The adult Millers Thumb is reported to be a voracious feeder and very destructive to other fish. It is interesting that the young resemble the adult in their ability and their willingness to capture large food animals which are proportionately large even in 12 millimeter specimens. It is well adapted to feeding upon large objects by its large terminal mouth.

Table illustrating the food of young of Cottus ictalops.

Length in mm.	12	13	14	15	16	17	18	19	20	21	22
No. examined	1	1	1	2	3	5	5	5	5	4	3
Articles of diet: Midge larvae	100.		100.	2.5	33.33+	22.6	20.	22.5	28.75		1.66+
May fly larvae		60.			51.66+	43.8	54.	25.	32.5	75.	81.66+
Amphipods				47.5	15.	27.4	18.	52.5	12.5	12.5	
Fish remains		40.					6.		20.	12.5	
Bottom debris									5.		
Beetle larvae				48.5							16.66+
Round worms						1.2					
Filamentous algae						1.					
Fish eggs				1.5		4.	2.				
Insect eggs									1.25		

Figures represent the percentage of the volume of the stomach contents.

CONCRETIONS IN LAKE DEPOSITS AT ELYRIA, OHIO

GEORGE D. HUBBARD
Department of Geology, Oberlin College

Excavations near the corner of Middle Avenue and Sixth Street, Elyria, made preparatory to the erection of heating plant extensions for the school buildings located there, have brought to light some calcareous sand and clay concretions in the making.

The pit is twelve or fourteen feet in depth. The section is as follows:

4. Filling, artificial, (clay, brick-bats, crockery, etc.), 2 ft.
3. Brown to yellow sands and clays.....8 ft.
2. Blue and blue-gray clays.....2 ft.
1. Blue sands.....1-2 ft.

Layer number one is micaceous sand and in parts argillaceous. It gives under the weight of horses and wagon and behaves much like quicksands. It seems to be full of water, but the water is not flowing through. Layer number two is dryer and is variable in thickness, the upper surface being quite uneven. In places the layers above seem to be pushed into it. In other parts a yellow stain seems to have penetrated the blue clays from some point or line of seepage, in concentric spheres or layers. Thus the yellow above and the blue below are mutually interpenetrating and uneven. It is along this uneven contact that the concretions occur. The circulating water responsible for the concretions seems to be moving through layer three and descending to number two.

Some of the concretions are small and of indefinite boundaries and shapes, some are larger and resemble in shape lemons, cocoanuts and even vases a foot high, with a diameter of three or four inches. Most concretions have a nucleus of some sort. In many of these there seems to be a twig or branch of wood, a quarter of an inch to an inch in diameter, which reaches the whole length of the structure. In most cases, this twig retains some of its woody structure and fiber. The clay and sand

surround the stem and the cementing has been done in concentric shells. Layers are thicker in the central part, which fact makes the concretion thicker in its equatorial zone. Only partial cementing has yet been effected, and acid tests indicate that the cement is calcium carbonate.

All the concretions were yellow or brown, although embedded in the blue clays. It is obvious that oxidized iron from the upper layers is penetrating the blue with the calcium carbonate and that both are being deposited, thus solidifying the clay and sand of the concretions. Yet the structure is still soft and can be easily cut with the finger nail. We have here a number of concretion shapes still in the process of making.

A few hundred yards north or down the slope lakeward from this deposit is the shore line of Lake Whittlesey, a precursor of the present Lake Erie; and some three miles south is the abandoned beach of the Maumee stage. This latter beach is known east of Elyria as Butternut Ridge, and the former is now occupied through the business section of town by Main Street. The clays and sands then are between the Maumee and Whittlesey beaches and therefore belong to the Maumee Lake stage. While Maumee Lake was held in on the north and east by ice and overflowed through the Fort Wayne, Indiana, outlet, its waves and currents built the Maumee beach around the Elyria embayment, and on its floor were laid the clays and sands found in the excavation. Hence the concretions can be correlated with the Maumee Lake stage and can be shown to be wholly post-glacial. Concretions have been completed in a time period equal to this, but those found at Elyria seem to be still in the process of growth and cementation.

PRESERVATION OF NATURAL CONDITIONS.

E. LUCY BRAUN
University of Cincinnati

The Ecological Society of America desires to publish a National and International list of areas suitable for biological study in North America and northern South America. All preserved areas in natural or semi-natural condition, such as forest preserves and bird and game sanctuaries; and all other areas in a natural state, even though they may not be preserved, should be included. It is hoped that the inclusion of tracts doomed to exploitation, but still in a natural state, will stimulate interest and lead to the selection of areas in regions where as yet there has seemed to be no interest in preservation.

Each area is to be described briefly. The description should include the following points, so far as possible:

(1) A statement as to the nature of vegetation—forest (and type), prairie, swamp, sand dune, etc.—and principal trees or other plants. If succession is well illustrated, this should be stated.
(2) The animals, including birds and fish, should be noted.
(3) The topography of the area—level, rolling, sharp, precipitous, dissected—and the altitude (highest and lowest points, or average for level areas) should be stated.
(4) If streams or lakes are present, describe briefly, as to current, depth, width, nature of bottom, purity, etc., and animal life.
(5) Locate area, and give directions for reaching it, with name of transportation company, and distance and direction from some easily located point or points. Give desirable means of reaching the area; on foot, by automobile, horseback. Name nearest post office and nearest town at which through trains stop.
(6) Give name of nearest town with hotel accommodations; or if camp outfit is desirable or necessary.
(7) Any reference to literature dealing with the areas described should be included.

(8) If the area is a preserve, state agency which owns, and controls and manages the preserve. (A preserved area is one publicly owned or owned by an incorporated institution).

The work of collecting the information about natural areas and preserves has been apportioned by states. In addition to the description of areas, information is wanted about other features of natural interest in each state.

(1) Caves: Name, location, approximate size (if known), geological formation.
(2) Location of unpolluted waters.
(3) Description of lake coast areas still in a natural condition.
(4) References to literature.

If *you* know of any preserve or natural area in Ohio (or elsewhere) which should be included, *describe it.* Do not fail to describe areas because you think it has already been done; additional data will invariably be added where descriptions are duplicated by different persons.

Do your share in helping to make that part of the "Naturalist's Guide" dealing with Ohio as complete as possible, by sending information as outlined above.